

This listing of claims will replace all prior versions, and listings, of claims in the application.

**LISTING OF THE CLAIMS:**

1. (Currently Amended) A method for calibrating grid parameters ~~for~~ of a photolithographic tool having a wafer stage and an alignment system, the method comprising the steps:

- a. providing a plurality of artifacts on the wafer stage outside of the substrate area, the artifacts being placed a known distance apart from each other;
- b. measuring the distance between the artifacts with the alignment system; and
- c. determining the distance between the measured distance ~~to~~ and the known distance between the artifacts; and
- d. using the determined distance between said measured and known distances to determine the grid parameters, including grid magnification and rotation calibrations, of the wafer stage of the photolithographic tool, independent of field parameters of said tool.

2. (Original) A method according to Claim 1, wherein the measuring step includes the step of:

moving a first of the artifacts to the alignment system;

using the alignment system to measure the location of the first of the artifacts;

moving a second of the artifacts to the alignment system; and

using the alignment system to measure the location of the second of the artifacts.

3. (Original) A method according to Claim 2, wherein the measuring step includes the further step of using said measurements of the locations of the first and second of the artifacts to determine the measured distance between the first and second of the artifacts.

4. (Original) A method according to Claim 1, wherein the providing step includes the steps of:

locating a first of the artifacts on a first side of said area; and

locating a second of the artifacts on a second side of said area, said second side being opposite said first side.

5. (Original) A method according to Claim 4, wherein both of said first and second of the artifacts are located on a common axis.

6. (Original) A method according to Claim 1, wherein:

the providing step includes the steps of

i) providing a first pair of artifacts a known distance apart from each other, and

- ii) providing a second pair of artifacts a known distance apart from each other; and

the measuring step includes the steps of

- i) measuring the distance between the first pair of artifacts, and
- ii) measuring the distance between the second pair of artifacts.

7. (Original) A method according to Claim 6, wherein:

the step of providing the first pair of artifacts includes the step of locating said first pair of artifacts on a first axis, on opposite sides of said area;

the step of providing the second pair of artifacts includes the step of locating said second pair of artifacts on a second axis, on opposite sides of said area; and

said second axis is perpendicular to the first axis.

8. (Currently Amended) A method for determining grid parameters ~~for~~ of a photolithographic tool having a wafer stage and an alignment system, the method comprising the steps:

- a. positioning a wafer on the stage;
- b. providing a plurality of artifacts on the wafer stage outside of the wafer, the artifacts being a known distance apart from each other;

- c. positioning a first of the artifacts at a defined location relative to the alignment system;
  - d. moving the wafer stage a predetermined distance, and forming a first structure on the wafer;
  - e. positioning a second of the artifacts at a defined location relative to the alignment system;
  - f. moving the wafer stage a predetermined distance, and forming a second structure on the wafer; and
  - g. measuring the offset between said first and second structures; and
  - h. using the measured offset between said first and second structures to determine the grid parameters of the wafer stage, including grid magnification and rotation calibrations, of the ~~photographic~~ photolithographic tool, independent of field parameters of said tool.
9. (Original) A method according to Claim 8, wherein the step of providing the plurality of artifacts includes the step of positioning the first and second of the artifacts on a common axis, on opposite sides of the wafer.
10. (Original) A method according to Claim 9, wherein the step of forming the second structure includes the step of forming the second structure on top of the first structure.

11. (Original) A method according to Claim 8, wherein:

said first and second structures are spaced apart; and further comprising the steps of:

forming another pair of structures on the wafer;

measuring the distance between said another pair of structures, and using the measured distance between said another pair of structures to determine the difference between field and grid parameters; and

using the measured offset between the first and second structures to provide the grid parameters.

12. (Currently Amended) Apparatus for determining grid parameters ~~for~~ of a photolithographic tool having a wafer stage and an alignment system, said wafer stage including a defined substrate area for receiving a substrate of an integrated circuit, the apparatus comprising:

- a. a plurality of artifacts on the wafer stage outside of the substrate area, the artifacts being placed a known distance apart from each other;
- b. means for measuring the distance between the artifacts with the alignment system; and
- c. means for determining the distance between the measured distance ~~to~~ and the known distance between the artifacts; and

- d. means for using the determined distance between said measured and known distances to ~~determining~~ determine the grid parameters, including grid magnification and rotation calibrations, of the wafer stage of the photolithographic tool, independent of field parameters of said tool.

13. (Original) Apparatus according to Claim 12, wherein the photolithography tool further includes an alignment system, and the measuring means includes:

means for moving a first and a second of the artifacts to the alignment system;

means for using the alignment system to measure the locations of the first and second of the artifacts;  
and

means for using said measurements of the locations of the first and second of the artifacts to determine the measured distance between the first and second of the artifacts.

14. (Original) Apparatus according to Claim 12, wherein the first and second of the artifacts are located on a common axis, on opposite sides of said area.

15. (Original) Apparatus according to Claim 12, wherein:

the plurality of artifacts include

- i) a first pair of artifacts a known distance apart from each other, on a first axis and on opposite sides of said area, and
- ii) a second pair of artifacts a known distance apart from each other, on a second axis and on opposite sides of said area; and

the measuring means includes means for measuring the distance between the first pair of artifacts and the distance between the second pair of artifacts.

16. (Currently Amended) Apparatus for determining grid parameters ~~for~~ of a photolithographic tool having a wafer stage, a wafer on the wafer stage and an alignment system, the apparatus comprising:

- a. a plurality of artifacts on the wafer stage outside of the wafer, the artifacts being a known distance apart from each other;
- b. means for positioning a first and a second of the artifacts at defined locations relative to the alignment system, and for moving the wafer stage predetermined distances from said defined locations;
- c. means for forming first and second structures on the wafer, after said wafer stage has been moved said predetermined distances; and
- d. means for measuring the offset between said first and second structures; and

- e. means for using the measured offset between said first and second structures to determine the grid parameters, including grid magnification and rotation calibrations, of the wafer stage of the photolithographic tool, independent of field parameters of said tool.

17. (Original) Apparatus according to Claim 16, wherein the first and second of the artifacts are on a common axis, on opposite sides of the wafer.

18. (Original) Apparatus according to Claim 16, wherein:

said first and second structures are spaced apart;

said means for forming are used to form another pair of structures on the wafer;

said measuring means are used to measure the distance between said another pair of structures, to use the measured distance between said another pair of structures to determine the difference between field and grid parameters, and to use the measured offset between the first and second structures to provide the grid parameters.

19. (New) A method according to Claim 1, wherein:

said grid parameters are grid placement errors;



said grid magnification and rotation calibrations are introduced while first level wafers are being stepped; and

the using step includes the step of calculating separate field errors and grid errors.